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tion, in which the terminology of Diptera is given; then follows an analytical table of families, and, except in the case of the Nematocera and Muscidæ, tables of genera are also given. There is appended to the work a Bibliography of the species described since the publication of Osten Sacken's catalogue. The whole forms a very convenient manual, and it cannot fail to stimulate the study of this much neglected order.

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## EMBRYOLOGY.<sup>1</sup>

NOTES ON THE DEVELOPMENT OF HOLOTHURIA.—The following interesting facts are taken from a note, not intended for publication, which was addressed to Prof. W. K. Brooks from Mr. Charles L. Edwards, who has been investigating the development of *Holothuria* at Green Turtle Key, Bahama Islands. As they refer to a type with an abbreviated development within the egg, it has been considered desirable to reproduce them.

"I tried artificial fecundation for some time without result. Then putting males and females together in a tub I could get no fertilized eggs. Finally, about two weeks ago (Aug. 1st), I arranged a live box, as recommended by Selenka, and with excellent results. I have since had no trouble in gathering fertilized eggs and upon four occasions. These Holothurians prove very interesting. The egg is quite opaque, but I have made out the following general conclusions from surface views, but as I have not yet had the eggs just at fertilization, for the animals do not generally discharge the eggs until five or six hours after being put into the box, I have not the exact age of the stages.

"The segmentation is regular and is completed in about seven or eight hours. The blastosphere is formed in about twelve hours. Then gastrulation takes place. Then follows a very complex development within the egg-shell. To all appearances the embryo passes through the Auricularia stage of free-swimming Holothurian larvæ. It then takes the form of the adult, develops five oral tentacles, and so formed, bursts forth from the shell about the fifth day and creeps about on the bottom of the dish. It has developed the beginnings of the spines in the egg, and these with tentacles now grow rapidly during the free larval state. On the sixth day a tentacle arises at the posterior end which grows rapidly, until on the eighth day it is longer than the oral tentacles. About this time a favorite attitude of the larva is to erect itself on the posterior

<sup>1</sup> Edited by Prof. Jno. A. Ryder, Univ. of Penna., Philadelphia.

tentacle, or more properly, I suspect, ambulacral foot, and wave the oral tentacles about. Of course this attitude is not held long, the creeping position, using all the tentacles or feet being most usual. On the eleventh day a seventh tentacle, and on the fourteenth an eighth tentacle appears; the former from about the middle of the ventral surface, and the latter at the base of the oral tentacles on the ventral side. In the meantime the spines have been getting longer and their bases branching in various rosette forms. I now have several larvæ fifteen days old getting along nicely, and from the four lots of eggs have saved forty-three vials of embryos, and so will probably get a complete series, as each set were no doubt fertilized at different times of the day and in any one lot the individuals do not develop evenly.

"These embryos seem to be intermediate between Kowalevsky's, where the adult state is attained without a metamorphosis, and the one described by Selenka. Of course I cannot tell what goes on inside the shell those four or five days after gastrulation and before the larvæ develops tentacles, as the egg is so very opaque. I should have said also that at first the eggs are brown, in a few days they show green pigment spots, and these increase until the free larva is quite green.

"In two or three weeks I shall probably have an abundance of material for sectioning and then I want to take in hand the case of the brown *Clypeaster*, common about here. I am getting fond of the study of the Echinoderms and shall work on them as I get opportunity.

"We came across the birth of an extraordinary zoological myth out here a few weeks since. One of the leading citizens, who is also the school-master, had made a discovery. Whereas they had always thought that the sea-stars come from the sand or from the big stars up above, now they had found the real source 'for true' as they put it. They told us of it and we thought we should be able to surprise the world with a borrowed discovery! But alas! they took us down to the shoal, broke open the *sand-dollars* and pulling out 'the creature' showed us the wonder—their young sea-star! They supposed that this young sea-star stayed in these old shells until grown and could hardly believe us when we told them that it was a live *Clypeaster*!"—C. L. E.